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I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation and Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein together with the statement of inventorship and of right to grant of a Patent (Form 7/77), which was subsequently filed.

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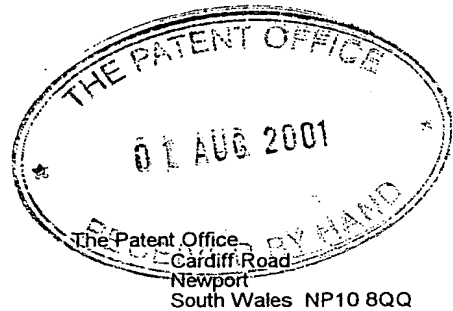
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Dated 24 August 2004

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Patents Form 1/77
Patents Act 1977
(Rule 16)

The
Patent
Office



Request for grant of a patent

1. Your reference
5387301/JAC/AJM

2. Patent Application Number

0118780.6

01 AUG 2001

3. Full name, address and postcode of the or of each applicant (*underline all surnames*)

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Patents ADP number (*if known*) 8144784001

If the applicant is a corporate body, give the
country/state of its incorporation

Country: ENGLAND
State:

4. Title of the invention
AN ARTICLE OF APPAREL

5. Name of agent

Beresford & Co

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to which all correspondence should be sent

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Patents ADP number ~~186~~ 1826002

6. Priority details

Country

Priority application number

Date of filing

Patents Form 1/77

7. If this application is divided or otherwise derived from an earlier UK application give details

Number of earlier application

Date of filing

8. Is a statement of inventorship and or right to grant of a patent required in support of this request?
YES

9. Enter the number of sheets for any of the following items you are filing with this form.

Continuation sheets of this form

Description

14

Claim(s)

7

Abstract

1

Drawing(s)

5

+5

10. If you are also filing any of the following, state how many against each item.

Priority documents

Translations of priority documents

Statement of inventorship and
right to grant of a patent (*Patents form 7/77*)

1 + 4

Request for preliminary examination
and search (*Patents Form 9/77*)

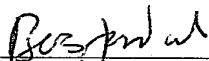
1

Request for Substantive Examination
(*Patents Form 10/77*)

Any other documents
(*please specify*)

11. I/We request the grant of a patent on the basis of this application

Signature



BERESFORD & Co

Date 1 August 2001

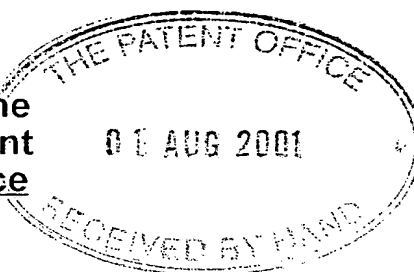
12. Name and daytime telephone number of
person to contact in the United Kingdom

CLARK; Jane

Tel: 020 7831 2290

Patents Form 7/77
Patents Act 1977
(Rule 15)

The
Patent
Office



**Statement of inventorship and of
right to grant of a patent**

The Patent Office
Cardiff Road
Newport
South Wales NP10 8QQ

1. Your reference
5387301/JAC/AJM

2. Patent Application Number
accompanying application reference 5387301

0118780.6

01 AUG 2001

3. Full name of the or each applicant
Innovision Research & Technology PLC

4. Title of the invention
AN ARTICLE OF APPAREL

5. State how the applicant(s) derived the right from the inventor(s) to be granted a patent
By virtue of employment

6. How many, if any additional Patents Forms
7/77 are attached to this form?
NONE

7. I/We believe that the person(s) named over the page (and on any extra copies of this form) is/are the
inventor(s) of the invention which the above patent application relates to.

Signature

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Date 1 August 2001

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Patents Form 7/77

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AN ARTICLE OF APPAREL

This invention relates to an article of apparel having a portion that can be illuminated, particularly but not
5 exclusively an item of footwear such as a shoe.

It is known to provide articles of apparel, such as shoes, with portions that can be illuminated for decorative or safety purposes, for example to enable the
10 wearer to be seen at night. In such shoes, the portion may be illuminated by lights such as LEDs (Light Emitting Diodes). Such LEDs may be arranged within the heel portion of shoe and be arranged to be permanently illuminated, or to flash intermittently (e.g. with the
15 footsteps of the wearer of the shoe).

An aspect of the present invention provides an article of apparel carrying a chamber having a light transmissive wall portion and means for illuminating the chamber, the
20 chamber having light affecting means, such that, in use, light from the illuminating means is scattered or reflected by the particles.

The light affecting means may be light affecting
25 particles moveable in the chamber. As another

possibility or additionally a wall portion of said chamber opposed to the light transmissive wall portion (a "back" wall) may have one or more light affecting regions (e.g. regions that are made up of light reflecting material). The one or more light affecting regions on the "back" wall of said chamber may be pictures or dots.

The "back" wall of said chamber may be dark in colour, e.g. black, to provide a good contrast with the light affecting means.

In an embodiment, the illuminating means may be provided on movement means to enable relative movement between the illuminating means said light affecting means.

The chamber may contain a liquid such as water or an oil. Where water is used it may be distilled water. As another possibility, the chamber may contain a gel.

Where the liquid is a liquid such as water, a surfactant may be added to a liquid in the chamber to reduce the surface tension of the liquid to facilitate prevention of light affecting particles floating on the surface of the liquid, where the light affecting particles are of lower density than the liquid, for example where the light

affecting particles are glitter and the liquid comprises water. Further, an additive such as ascorbic acid may be added to keep the liquid clean and free from bacteria.

5 The light transmission wall portion, or window, of said chamber may be formed of light transmissive plastics material.

10 The illuminating means may comprise one or more LEDs that may be of the same or different colours. The illuminating means may be arranged to be hidden from view.

15 In an embodiment the light affecting means may be light scattering or reflecting particles moveable within the chamber such as light reflecting and/or coloured, such as metallic, coloured glass or coloured plastic particles.

20 A control means may be provided for activating the illuminating means. The control means may be responsive to motion of the user, for example to footsteps of the user.

25 The control means may include a motion sensor such as a piezoelectric, mechanical, tilt, or pressure switch.

In an embodiment with more than one illuminating means, the control means may be arranged to activate said more than one illuminating means in a predetermined sequence.

5 The article of apparel may be a shoe and the chamber is provided on the side or in the heel of said shoe.

Embodiments of the invention will now be described by way of example only and with reference to the accompanying
10 drawings, in which:

Figure 1 is a perspective diagram showing a shoe embodying the invention;

15 Figure 2 is a schematic block diagram of a circuit for controlling illumination means shown in Figure 1;

Figure 3 is an exploded perspective diagram showing another shoe embodying the invention;

20 Figure 4 is a flow diagram showing a sequence of events which occur in the circuit of Figure 2; and

Figure 5 is a perspective diagram showing a rear
25 perspective view of another shoe embodying the invention.

Figure 1 illustrates a shoe 1 having an upper 3 and a sole 5. An aperture is provided in said upper 3 having a pocket behind (not shown) to receive a chamber 9. The chamber 9 contains light affecting particles. In this embodiment, said chamber contains a liquid consisting of 75% distilled water and 25% surfactant (fluorochemical surfactant FC-170C, produced by Fluorad™) and containing as the light-affecting particles metallic particles 900 in the form of so-called glitter that is commercially available at many outlets such as newsagents, stationers and the like.

The chamber is a plastics material chamber into which the liquid is injected through an aperture which is then sealed.

The surfactant is provided to reduce the surface tension of the water, to inhibit the glitter from merely floating on the surface of the water. An additive such as ascorbic acid may also be added to the water/surfactant mixture to keep it clean and also to prevent the formation of bacteria.

The shoe 1 is also provided with an illuminating

arrangement 11 which consists of two sets of LEDs contained in respective pouches 15 secured, for example by stitching or gluing, to the inside of the upper 3 of said shoe 1 on either side of the chamber 9. In this particular embodiment, there are three LEDs arranged on each side of the chamber with a red LED, a green LED and a blue LED on each side. A light-transmissive wall portion or window 9a of said chamber 9 allows the affect of the particles on the light to be viewed. Positioning the LEDs on either side of the chamber 9 means that they cannot be viewed through the wall portion or window 9a. A "back" wall of said chamber (that is a wall opposed to the light transmissive wall portion 9a) is dark in colour, e.g. black, to enable the affect of the particles on the light to be viewed more easily through the wall portion or window 9a.

A control circuit 13 is provided in the sole 5 of said shoe 1 for controlling activation of the LEDs 11.

Figure 2 shows a functional block diagram of the control circuit and its coupling to the LEDs.

As shown in Figure 2, the control circuit 13 comprises a piezoelectric switch 17, a microcontroller (or

microprocessor with associated memory) 19 and a number of LED drivers 21 for driving LEDs 11. The piezoelectric switch 17 is coupled to the microcontroller 19 and is arranged to detect changes in pressure in the material of the sole 5 of the shoe 1 in which it is embedded, i.e. changes in pressure in the sole 5 due to the wearer's footsteps. The microcontroller 19 is arranged to output control signals for causing activation of LEDs 11 when the output from the piezoelectric switch 17 rises above a threshold voltage V_t .

The LED drivers 21 are of conventional form and may be integrated circuit (IC), or made up of discrete components. Further, the entire control circuit 13 may be provided as a single integrated circuit.

It will, of course, be appreciated that, in the interests of simplicity, the power supply connections to the components of the control circuit 13 are not shown in Figure 2. The power source for such a circuit may be a battery (not shown) located in the sole of the shoe.

Figure 3 shows an exploded perspective diagram of another shoe embodying the invention.

Like reference numerals are used to indicate those parts which have previously been described in Figure 1.

The shoe in Figure 3 differs from that described above in that the chamber 9 is provided in a self-contained illumination unit 150 (formed of cloth or moulded from rubber or a plastics material, for example) which is arranged such that it can be attached to a portion 15, (shown in phantom lines) of the shoe 1 by, stitching or adhesive, or the like. The LEDs 11 are arranged on either side of the chamber 9 within said illumination unit 150. A flap 150a extending from a main body of the illumination unit 150 contains wires for coupling the LEDs 11 to the control unit 13. As shown in the figure, when the illumination unit 150 is in position on area 151 on the upper 3 of the shoe 1 the portion 150b of the illumination unit 150 from which the flap 150a extends is aligned with the region where the upper 3 meets the sole 5 of the shoe 1. The flap 150a is received within the sole 5 such that it cannot be seen when the sole 5 is attached to the upper 3. The ends of the wires from the LEDs 11 emerging from the end of the flap 150a remote from the illumination unit 150 are coupled to the control unit 13.

The operation of the microcontroller 19 and how it causes the chamber 9 to be illuminated as the wearer of the shoe 1 moves will now be described with reference to Figure 4.

5 As shown in Figure 4, at step S1 the microcontroller 19 monitors the output from the piezoelectric switch 17 to detect whether the output is above the voltage threshold V_t (Step S1). If the output voltage is above the threshold level V_t the microcontroller outputs control
10 signals to the LED drivers 21 (step S2) to cause the LEDs to light up in a lighting sequence. If the output of the piezoelectric switch 17 is below the threshold voltage V_t the microcontroller 19 repeats step S1. As the lighting sequence is being output to said LED drivers the
15 microcontroller continues to detect the output of the piezoelectric switch 17 (step S3) and outputs the control signals to the LED drivers 21 (step S2) until, at step S3, the microcontroller 19 determines that the output of the piezoelectric switch 17 has fallen below the
20 threshold voltage V_t . The microprocessor 19 then stops outputting the control signals to the LED drivers 21 (step S4) and returns to step S1.

25 The control signals may cause the LEDs to light in any predetermined sequence. In the present embodiment, the

control signals cause the red, green and blue LEDs 11 arranged on one side of the chamber to flash alternately with those arranged on the other side of said chamber. In other examples the control signals may cause all the LEDs 11 to flash on and off with each footstep of the wearer of the shoe 1, or cause half of the LEDs 11 to flash during one footstep, and the other half of the LEDs 11 to flash during the other footstep. The microcontroller 19 may also be programmed with a number of different lighting sequences and be programmed to move from one lighting sequence to another in a predetermined order or at random. In addition, the or a lighting sequence may be a random lighting sequence.

Figure 5 shows a rear portion of another shoe embodying the invention.

Like reference numerals are used to indicate those parts which have previously been described in relation to Figure 1.

The shoe shown in Figure 5 differs from that shown in Figure 1 in that the chamber 9 is provided in a heel portion 1a of said shoe 1 and in the placement of the LEDs 11. Thus, as shown, the LEDs 11 are arranged within

the heel of the shoe 1 so that light emitted from the LEDs 11 shines outwards through the chamber 9. The LEDs, however, are still arranged so that they cannot be seen through the window or wall portion 9a.

5

An advantage of providing the chamber 9 in the heel portion of the sole 5 of the shoe 1 as shown in Figure 5 is that the chamber 9 can be easily accommodated in the moulding process.

10

The control circuit required to drive the LEDs 11 is identical to that previously described in relation to Figures 2 and 4.

15

The chamber 9 may be filled with a liquid other than the water and surfactant mixture and having a different viscosity, thus altering how the particles move with said liquid. An example of liquid that may be contained within the chamber 9 is a light oil. Further the ratio

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of water to surfactant may differ from that in the embodiments. As another possibility, the chamber may contain a gel within which the particles are suspended.

The liquid or gel may be colourless or coloured. The chamber 9 may also contain two immiscible liquids (e.g.

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oil and water) which may be of different colours and each

one of said two immiscible liquids may have the same or different colour particles suspended therein. Also, even where the liquid comprises water the use of a surfactant may not be necessary if the particles are such as to be neutrally buoyant in the liquid.

The shape of the chamber 9 may also be different from that shown in the figures. As an example, the chamber 9 may take the form of the manufacturer's logo, and there may be more than one chamber provided on the shoe which may have different colour LEDs. Also the chamber or chambers may be located at different positions on the shoe, for example on the toe of the shoe.

The piezoelectric switch may be replaced by a mechanical switch such as a cantilevered spring or a pressure switch, to detect pressure changes in the sole of the shoe which correspond to a wearer's footsteps, or a mercury tilt switch to respond to changes in attitude of the shoe due to the footsteps of the wearer.

The back wall of the chamber 9 may be light reflective to enhance the effect of said particles on said light emitted from said LEDs 11.

The back wall of said chamber may be provided with light affecting portions which may be light affecting, e.g. light reflecting particles embedded in the back wall or may be provided as light affecting regions of a picture on the back wall formed using, for example a light reflective paint. This feature may be provided in place of or in addition to providing light affecting particles in the chamber.

10 The illuminating means may be provided on movement means (that is, for example, the couplings of the LEDs to the control unit may include spring elements) such that the illuminating means move as the wearer moves.

15 Further, said light affecting portions on said back wall may be a picture, or dots.

In an alternative arrangement to the above embodiments, the LEDs may be arranged such that they are visible through said chamber 9 when viewing said chamber 9.

20 In the above embodiments, the light affecting particles are metallic particles such as glitter. These may be replaced by other types of reflective particles or by coloured glass or plastic particles or any combination of

these. It may also be possible to use particles that fluoresce or phosphoresce when illuminated.

5 The chamber 9 and control unit 13 may be sold separately from a shoe so that a shoe manufacturer can fit the chamber and control unit to the shoe. Also, the illumination unit shown in Figure 3 may be sold separately for fitting to a shoe by a manufacturer.

10 As shown, the shoe is a sports shoe, for example a trainer. The present invention may, however, be applied to any type of footwear.

15 The present invention may also be applied with different articles of apparel e.g. gloves, t-shirts, shorts, etc. and the control unit activated by a motion sensor that detects motion of a wearer or of part of the wearer.

CLAIMS:

1. An article of apparel, such as a shoe, carrying a chamber and illuminating means for illuminating the chamber with light, the chamber having light-affecting means adapted to affect light from the illuminating means, and the chamber having a window for enabling the effect of the light affecting means on light from the illuminating means to be viewed.

2. An article of apparel according to claim 1, wherein said chamber contains a liquid.

3. An article of apparel according to claim 2, wherein said liquid comprises a mixture of water and a surfactant.

4. An article of apparel according to claim 2 or claim 3, wherein said liquid comprises an antibacterial additive.

5. An article of apparel according to claim 1, wherein said chamber contains a gel.

6. An article of apparel according to any preceding claim, wherein said window is formed of light

transmissive plastics material.

7. An article of apparel according to any preceding claim, wherein said illuminating means is positioned so as not to be seen through the window.

8. An article of apparel according to any preceding claim, wherein said illuminating means comprises at least one LED.

9. An article of apparel according to any preceding claim, wherein said illuminating means comprises a number of different colour light sources.

10. An article of apparel according to any preceding claim, wherein said light affecting means are light reflecting.

11. An article of apparel according to any preceding claim, wherein said light affecting means are coloured.

12. An article of apparel according to any preceding claim, wherein said light affecting means are metallic.

13. An article of apparel according to any preceding

claim wherein said light affecting means are coloured glass or plastic.

5 14. An article of apparel according to any one of the preceding claims wherein the light affecting means comprise particles moveable in the chamber.

10 15. An article of apparel according to any preceding claim, wherein a back wall of said chamber is dark in colour enabling the effect of the light affecting means on the light from the illuminating means to be viewed in greater contrast.

15 16. An article of apparel according to any preceding claim, wherein said light affecting means comprise one or more portions of light affecting material on a wall of said chamber.

20 17. An article of apparel according to claim 16, wherein said one or more portions of light affecting material form an image.

25 18. An article of apparel according to claim 15 or claim 16, wherein said one or more portions of light affecting material are dots.

19. An article of apparel according to any preceding claim, wherein said illuminating means are provided on a movement means for enabling relative movement between the illuminating means and said light affecting means.

5

20. An article of apparel according to any preceding claim, further comprising control means for activating said illuminating means.

10

21. An article of apparel according to claim 20, wherein said control means includes a motion sensor.

15

22. An article of apparel according to claim 21, wherein said motion sensor is responsive to motion of a wearer of the article.

20

23. An article of apparel according to claim 21, wherein said motion sensor is responsive to footsteps of the wearer.

25

24. An article of apparel according to any one of claims 21 to 23, wherein said motion sensor comprises a piezoelectric switch.

25. An article of apparel according to any one of claims

21 to 23, wherein said motion sensor comprises a pressure switch.

26. An article of apparel according to any one of claims
5 21 to 23, wherein said motion sensor comprises a mechanical switch.

27. An article of apparel according to any one of claims
10 21 to 23, wherein said motion sensor comprises a tilt switch.

28. An article of apparel according to any one of claims
20 to 27, wherein said control means is operable to cause the illuminating means to carry out a predetermined or
15 random lighting sequence.

29. An article of apparel according to any one of claims
20 to 27, wherein the illuminating means comprises a plurality of different colour light sources and the
20 control means is operable to activate the light sources in a predetermined or random sequence.

30. An article of apparel according to any preceding claim, wherein the illuminating means is arranged so as
25 not to be visible through said window.

31. An article of apparel according to any preceding claim, wherein said article of apparel is a shoe and said chamber is provided on a side of said shoe.

5 32. An article of apparel according to any one of claims 1 to 30, comprising a shoe having said chamber in its heel.

10 33. A chamber for attachment to an article of apparel, wherein said chamber can be illuminated with light, the chamber containing light affecting means adapted to affect light from an illuminating means, and the chamber having a window for enabling the effect of the light affecting means on the light from the illuminating means
15 to be viewed.

34. A kit comprising a chamber in accordance with claim 33, and illuminating means for incorporation in a shoe to illuminate the chamber.

20

35. A kit according to claim 34, further comprising control means for controlling the illuminating means.

25

36. An article of apparel, such as a shoe, carrying a chamber and means for illuminating the chamber with light

substantially as hereinbefore described with reference to and as illustrated in Figures 1, 2 and 4 or Figures 2, 3 and 4 or Figures 2, 4 and 5 of the accompanying drawings.

- 5 37. An illumination unit for an article of apparel, such as a shoe, substantially as hereinbefore described with reference to and as illustrated in Figure 3 of the accompanying drawings.

ABSTRACTAN ARTICLE OF APPAREL

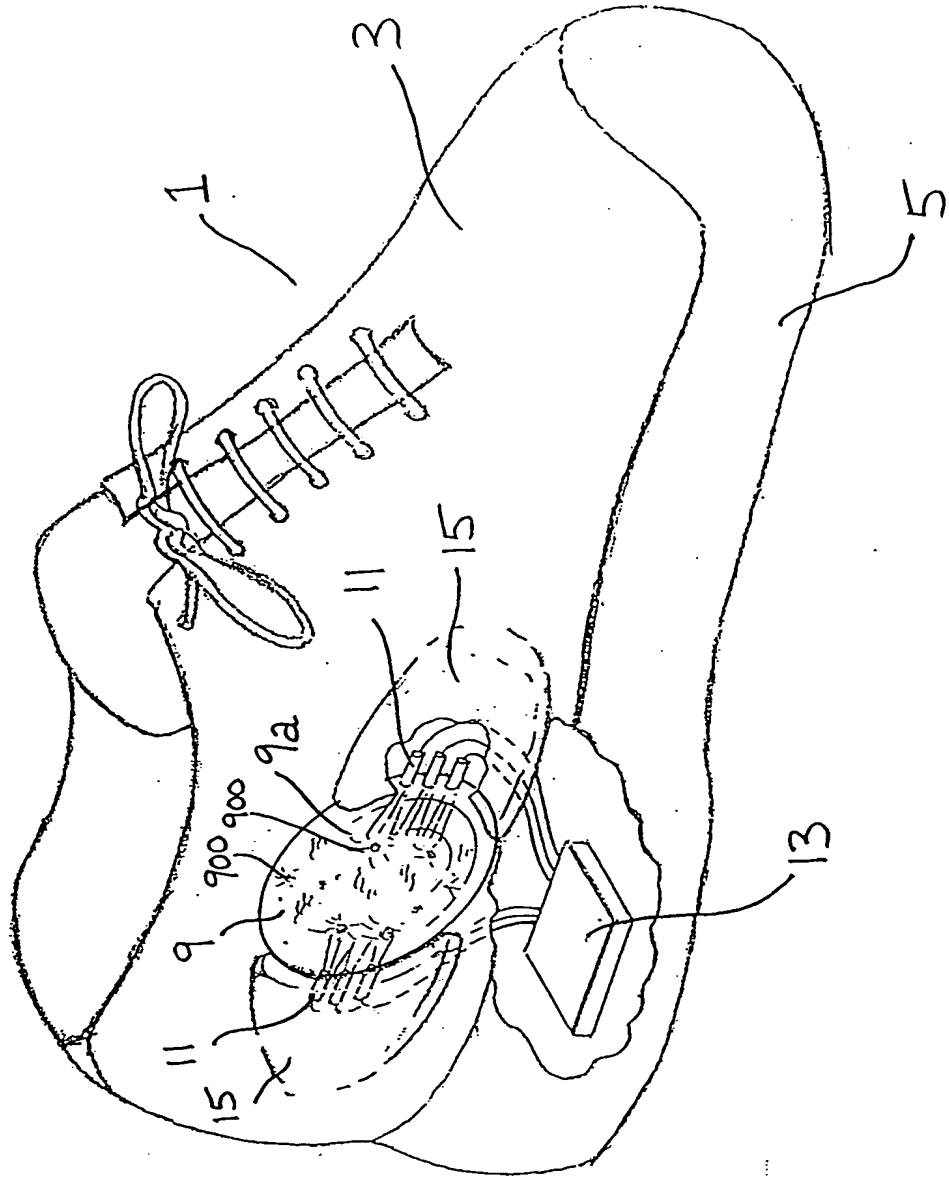
An article of apparel has a chamber (9) and carries light sources (11) for illuminating the chamber with light.

5 The chamber (9) contains particles (900) which can scatter or reflect light from the light sources and has a window (9a) through which the effect of the particles (900) on the light from the light sources (11) can be viewed.

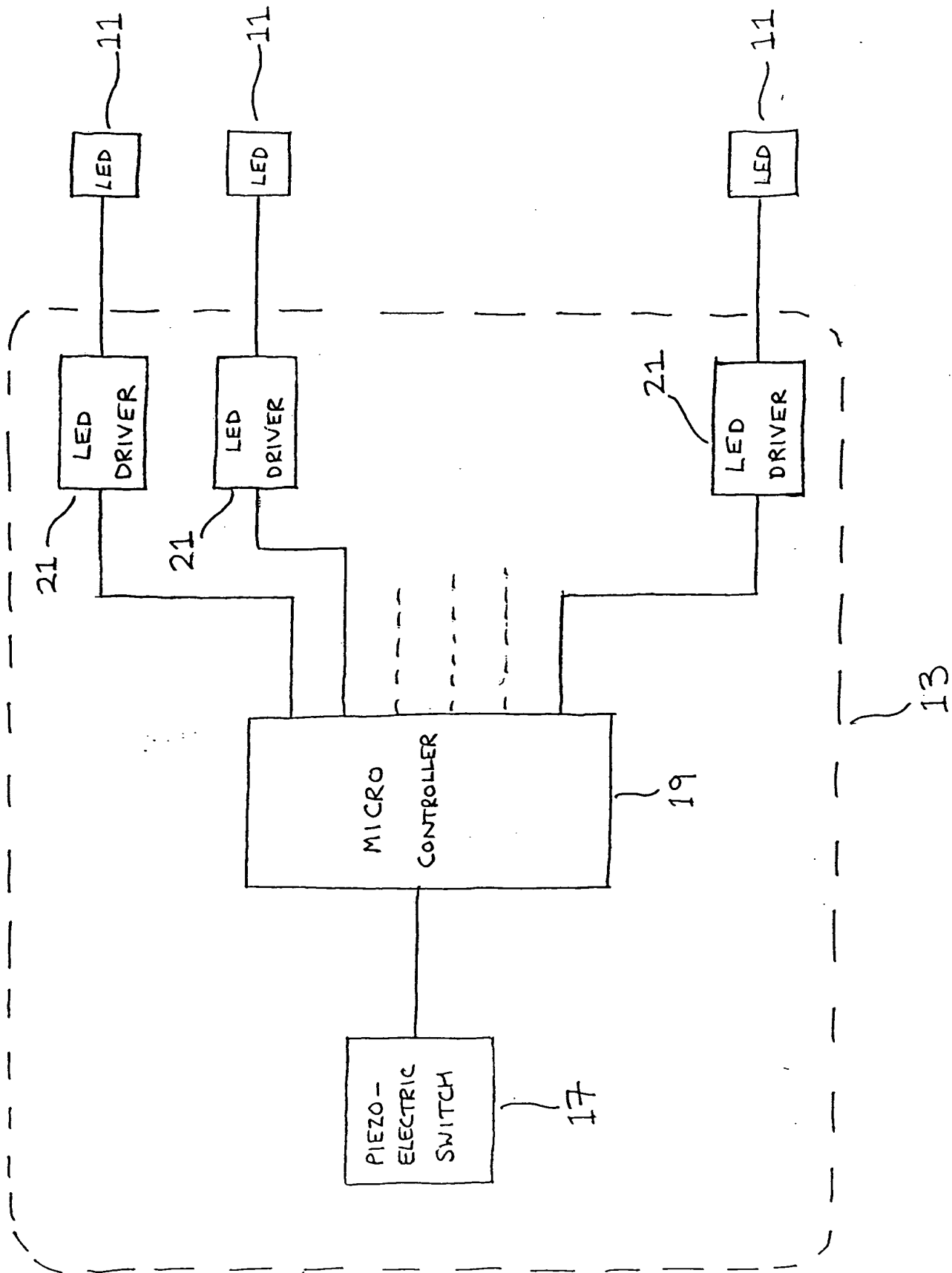
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(Fig. 1)

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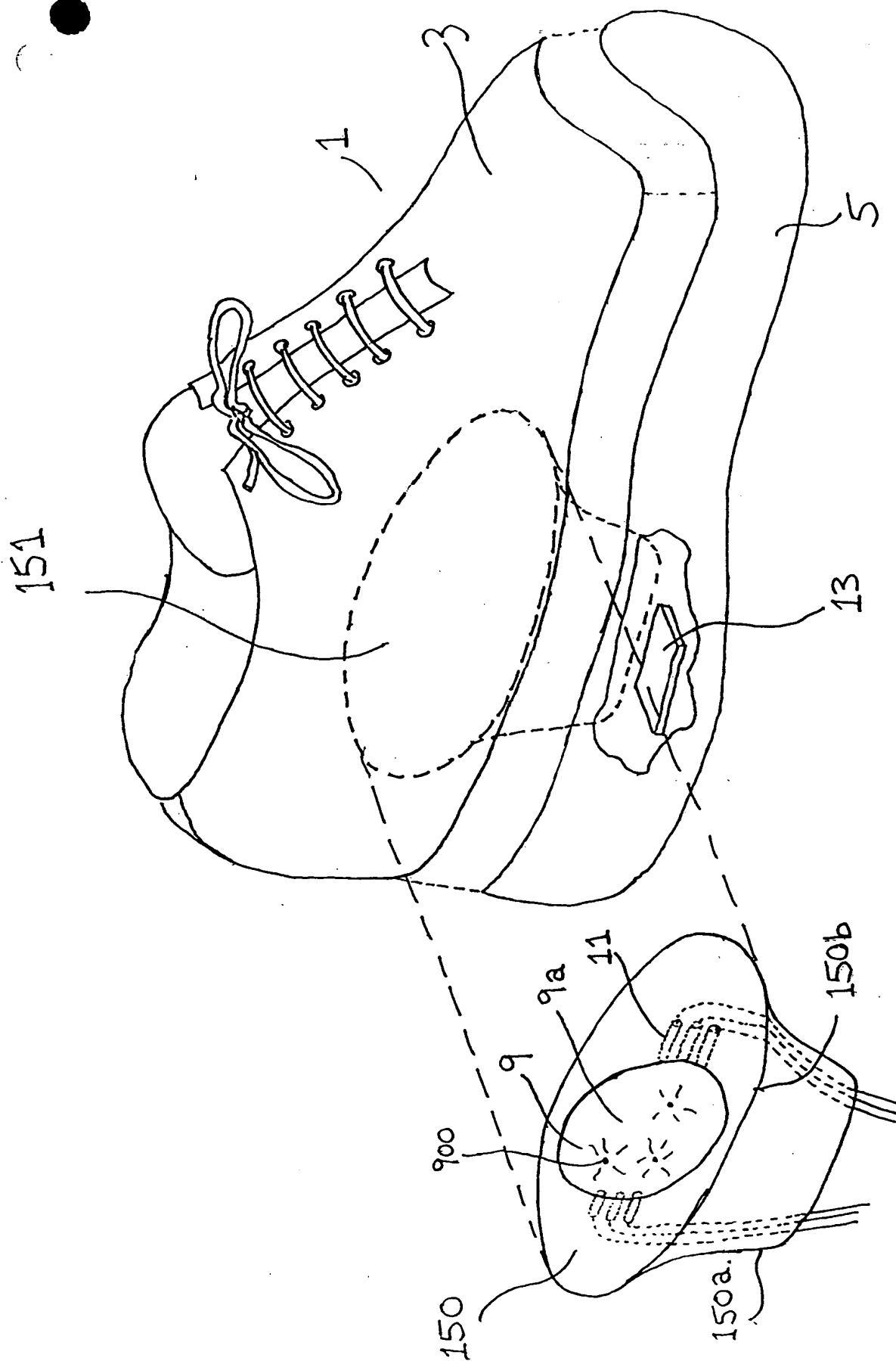


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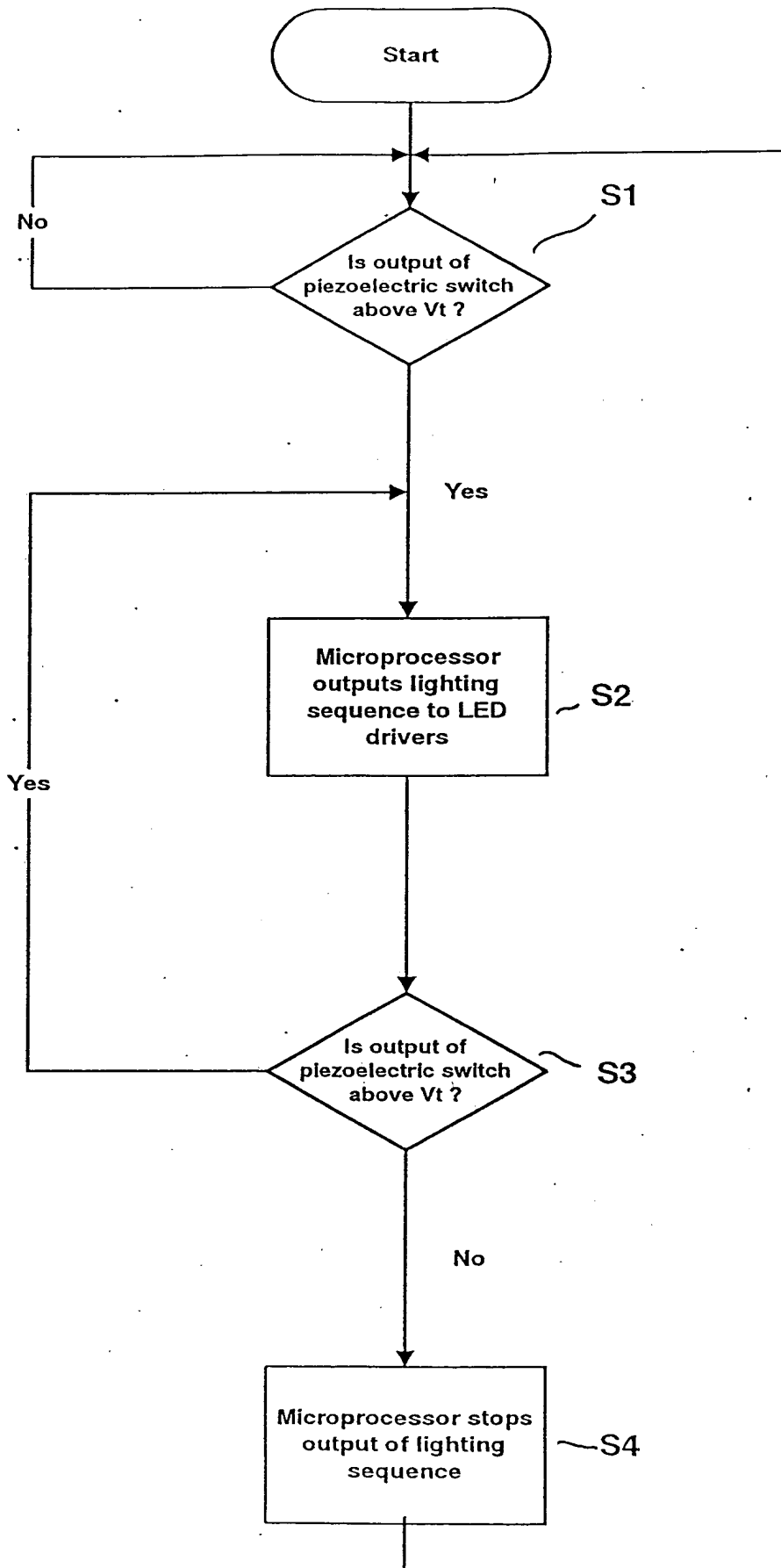
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Fig. 3



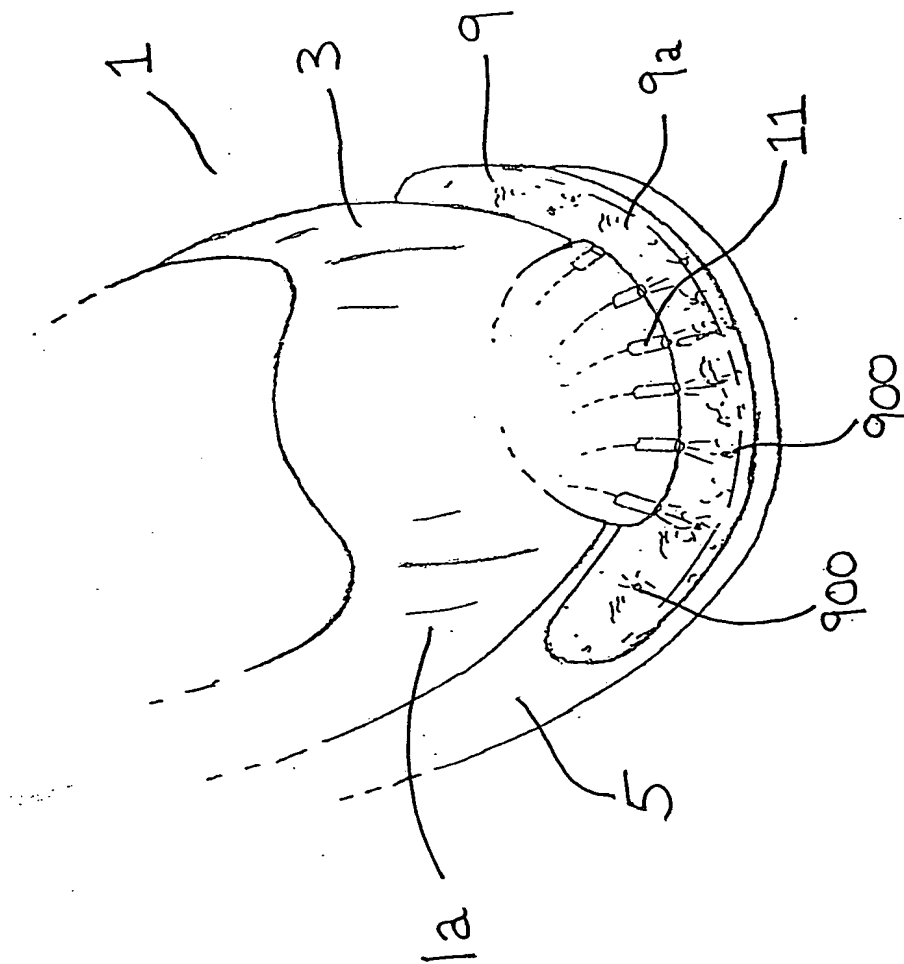
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Fig.4



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Fig. 5



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